Minicourse on Inverse Problems

Program

March 19 (Wed)

10:00-11:00 Gunther I
11:20-12:20 Nakamura I
14:00-15:00 Kang I

March 20 (Thu)

10:00-11:00 Gunther II
11:20-12:20 Nakamura II
14:00-15:00 Kang II
15:20-16:20 Gunther III

March 21 (Fri)

10:00-11:00 Kang III
11:20-12:20 Nakamura III

⁎ *All talks will be held in room 308 of New Math Building at the Department of Mathematics.*

Titles and Abstracts

Professor Gunther Uhlmann (University of Washington)
Title: *Invisibility*
Abstract: *We describe construction of electromagnetic parameters that make objects invisible to electromagnetic waves.*

Professor Gen Nakamura (Hokkaido University)
Title: *Reconstruction methods for inverse problems*
Abstract: *For the recent 10 years the several reconstruction methods have been proposed for inverse scattering problems and inverse boundary value problems. For instance they are the linear sampling method, factorization method, probe method,*

singular sources method, no-response test, range test and enclosure method etc. These reconstruction methods are non-iterative methods which means that they are not data fitting methods such as the least square methods or the regularized version of those. They provide how to reconstruct the unknowns directly from the given measured data. The lecture will touch the basic ideas of those methods and discuss about their convergence and relations between them.

Professor Hyeonbae Kang (Seoul National University)
Title: *Small volume imaging*
Abstract:
Lecture 1. Method of Small Volume Expansions and its Applications to Medical Imaging

I will explain the mathematical theory of the small volume expansions in the context of the conductivity equation, which is the simplest possible model. I then discuss how this mathematical theory can be applied to an electrical impedance tomography problem to detect small inclusions buried inside a body.

Lecture 2. Mathematical Analysis for MRElastography and Applications

MRElastography is a recent modality to image the internal part of body using the internal measurements of the displacement vectors. One of the advantages of the imaging method using MRE over other methods is that it can detect the stiffness parameter of the tissue, by which we can distinguish malign cancer from benign cancer. In this lecture I will explain a new method of reconstruction using MRE data.

Lecture 3. New reconstruction methods for Magneto-acoustic Imaging

A new and promising technique in the medical imaging is to excite a local part of body using acoustic or ultrasonic focusing and to measure changes due to the excitation. I will explain new reconstruction methods for the Magneto-acoustic imaging and the vibration potential tomography.